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Winter track transects : Fundy National Park

Date: 1989/90

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OOPAC EXC 1

1989-1990 WINTER TRACK TRANSECTS
FUNDY NATIONAL PARK

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Resource Conservation
Fundy National Park

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ABSTRACT

This report is an annual update of the track transect survey initiated in Fundy National Park in 1977. The objective of this study is to compare mammal population densities and winter distribution of mammals through the use of track indices and was originally established by the Canadian Wildlife Service.

The field work consists of walking selected transect lines through representative habitat types and identifying and counting tracks for all mammal species encountered. This report is a combination of two years' data (1989-1990) from the transect lines. In 1989 all lines were completed and in 1990 two lines were not completed, numbers 15 and 16 in Area III. Track indices were calculated for each species giving relative population densities. In 1989-1990 predators - coyote, fox and bobcat - decreased from 1988 along with varying hare and mice.

White-tailed deer indices are low in 1989 and tracks were recorded in Areas I and III. In 1990 no tracks were recorded on the transect lines completed. Deer were observed in the coastal area of the park. White-tailed deer populations appear to be at the lowest level since track transect indices were began.

It should be noted that this is a progress report only and this paper should not be referenced without citing its progress report status. For an overall insight into this study, reference should be made to all previous track transect reports.

METHODOLOGY

Transects were selected on the basis of accessibility, topography, forest cover type and location within the Park (Bateman, 1977). Transect lines were in a magnetic east-west direction beginning at a road or trail accessible by car or snowmobile.

Biophysical maps (1:12,500) prepared by the Forest Management Institute were used to measure the distance which each transect passed through major vegetation types - softwood (30%), hardwood (8.2%), mixed wood (57%) and other (4.3%). Unforested areas such as bogs, old fields, roads, streams, and alder swales were grouped as "other" cover types.

The number of days since last snowfall (track days), weather conditions and pertinent information about snow cover were recorded each day of the study. Tracks were recorded on a Track Transect Data Sheet (Figure I).

The Park is divided into four areas (Figure II) primarily on the basis of topography. Divisions between the areas were roads, trails or waterways. The basic unit of measure is a function of the number of tracks in a given area, the length of transect sampled and the number of track days (days since snowfall). The formula used to calculate the indices is given below:

$$*TI = \frac{TTS\ x}{[(L1 \times TD) + (L2 \times TD) + \ldots\ldots\ldots + (Ln \times TD)]} \times 100$$

TI - Track Indices

TTSx - Total tracks for Species X

Ln - Length of transect line n (Km)

TD - Track days or days since snow for Line N.

The percentage of each habitat type sampled is given in Appendices I and II.

TRACK TRANSECTS - FUNDY NATIONAL PARK

[redacted]te:_____ Transect No.:_____ Location:_____

[redacted]eather Conditions:_____

[redacted]now Depth:_____cm Condition:_____

[redacted]rs since last snow:_____ Observers:_____

COVER TYPES

[redacted]ECIES	SOFTWOOD		HARDWOOD		MIXED WOOD		OTHER			
	No.of tracks	Est.no. animals	No. of tracks	Est.no. animals	No.of tracks	Est.no. animals	No.of tracks	Est. no. animals	Specify*	Total
[redacted]										
[redacted]										
[redacted]									

FIGURE 2 TRACK TRANSECTS AND AREAS 1-4

RESULTS

In 1989 the twelve transect lines that have been completed since 1982 were completed in February and March. The twelve lines completed were 1, 5, 6, 8, 10, 11, 13, 15, 16, 18 and 20 for a total of 50.07 kilometres. (Prescott and Bateman, 1978).

Thirty-one percent of the total transect was through softwood, eight percent through hardwood, fifty-seven percent through mixed wood and four per cent through "other" areas.

Snow depth during the transect period was 10 to 100 cm. The Transect lines 15 and 16 had the least amount of snow while the transect lines on the highlands had the most.

In 1990 only 10 transect lines were completed: 1, 5, 6, 8, 18, 11, 12, 13, 18, and 20, for a total of 41.65 km. The two transect lines 15 and 16 that were not completed because of manpower and snow conditions (Area III).

Thirty-one percent of the total transects in 1990 was through softwood habitat, ten percent through hardwood, fifty-one percent through mixed wood and two percent through "other" areas.

Snow depth during the transect period was 50 to 100 cm.

A discussion of each mammal species and the relationship to date from previous years is given below.

White-tailed Deer (Figure 3)

In 1989 White-tailed deer tracks were recorded in Areas I and III and in 1990 no white-tailed deer tracks were recorded in the areas completed I, II, and IV.

In the winters of 1989 and 1990 deer migrated to the coastal area. Heavy snowfall in December 1989 caused the deer to migrate to the coastal areas. Snowfall in 1990 began in mid-November and by early January approximately 100 cm was on the highlands. Snow depth on the highlands in 1989 and 1990 was close to 100 cm. This causes deer travel to be restricted.

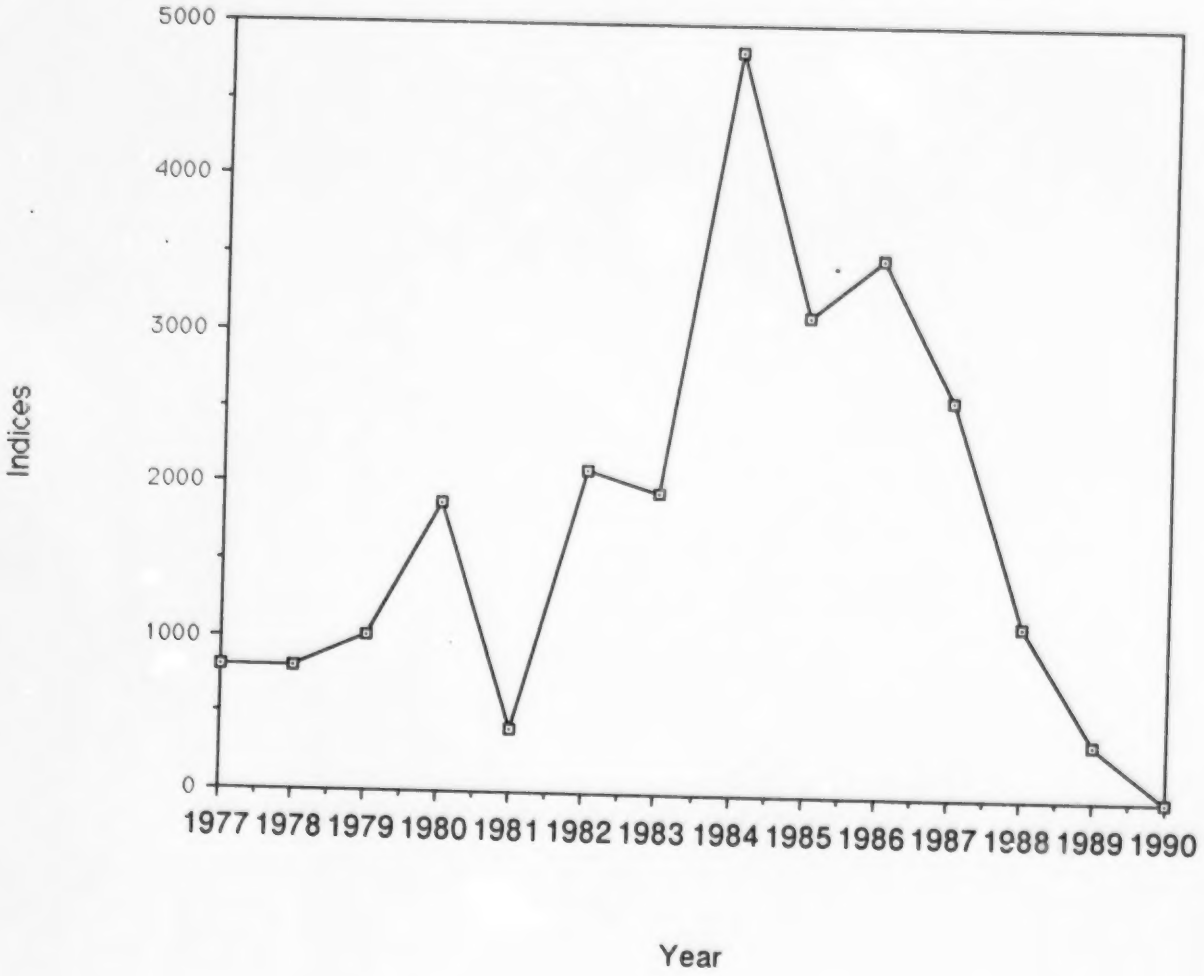
The track transect data for 1990 does not mean the deer population declined, because deer were observed on the coastal area of the park frequently (pers. obs. S. Sinclair, et al.).

In 1989-90 snow depth was 10-25 cm on the coast and approximately 100 cm on the highlands. Most of the deer tracks were recorded south of the Point Wolfe Road in 1989.

A number of dead deer were found in the winters of 1989 and 1990. If femurs were available they were collected and tested for percentage of fat content. In 1989 the femurs that were tested showed a low fat content <30%. In 1990 the femurs found were again tested but the fat content was much higher, between 50-90%. A number of these deer were killed by coyotes, other can be attributed to vinter kill. In 1990 the coyotes took a number of healthy white-tailed deer, concluded from fat content of femurs.

In conclusion, white-tailed deer numbers have declined significantly since 1988, most likely due to two years of deep snow conditions and predators. Snow conditions on the highlands in 1989 and 1990 were over 100 cm, thus causing deer difficulty in ranging for food and forcing the herd to move to the coast. Coyote predation on deer in 1990 appears to be on the increase as the rabbit population is at a low cycle The deer herd in Fundy National Park, because of the snow and predation by coyote, appears stable but low for the last 3 years.

Figure 3 **Track Indices for White-tailed Deer Fundy National Park**



Moose (Figure 4)

In 1989 moose tracks were observed in Areas I and IV, as compared to Area I in 1988. In 1990 moose tracks were observed in Area IV. Snow depths of over 90 cm restricts moose travel and during the transect period, moose travel was restricted. The moose population still remains low in Fundy National Park.

Squirrel (Figure 5)

In comparison to other years, 1989 had the highest squirrel track indices since 1977. In 1990 the track indices declined but still remain high.

Squirrel indices were highest in the softwood stands of the park. Highest track indices were in Areas II and III in 1989 but were in Areas I and II in 1990, although Area III was not surveyed.

No distinction was made between red and flying squirrels, although most tracks were assumed to be red squirrel.

Porcupine (Figure 6)

Tracks for porcupine were recorded in Areas II and III in 1989 and only in Area I in 1990. Area III always had the highest indices for porcupine but was not surveyed. Porcupine tracks were observe in both softwood and mixed wood stands in 1989 but only in the softwood stand in 1990.

Track transect indices for porcupine show considerable fluctuations since 1978. This probably reflects snow depths during transect periods more than any other factor.

Figure 4

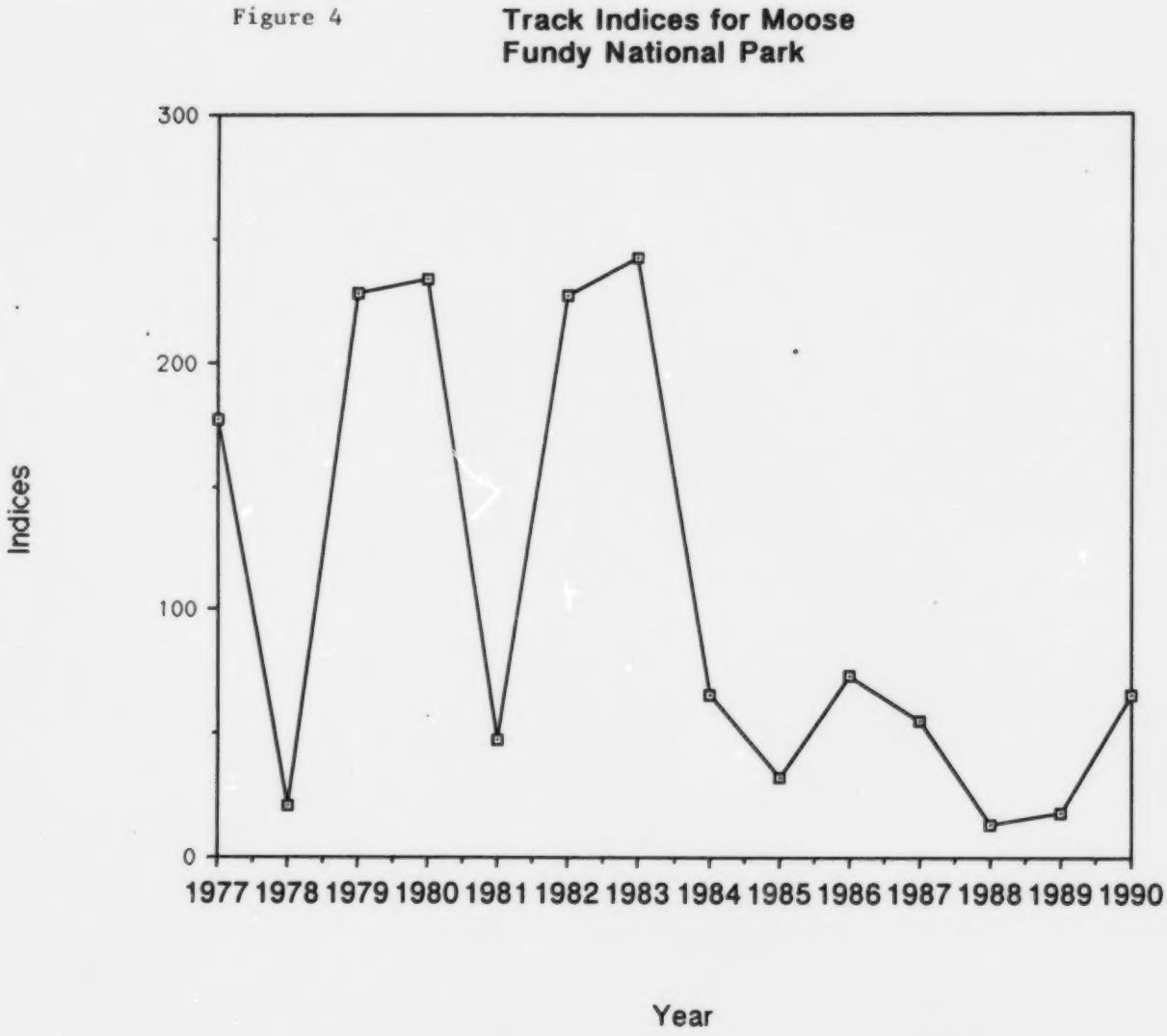

Track Indices for Moose
Fundy National Park
300
200
100
0
Indices
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Figure 5 **Track Indices for American Red Squirrel Fundy National Park**

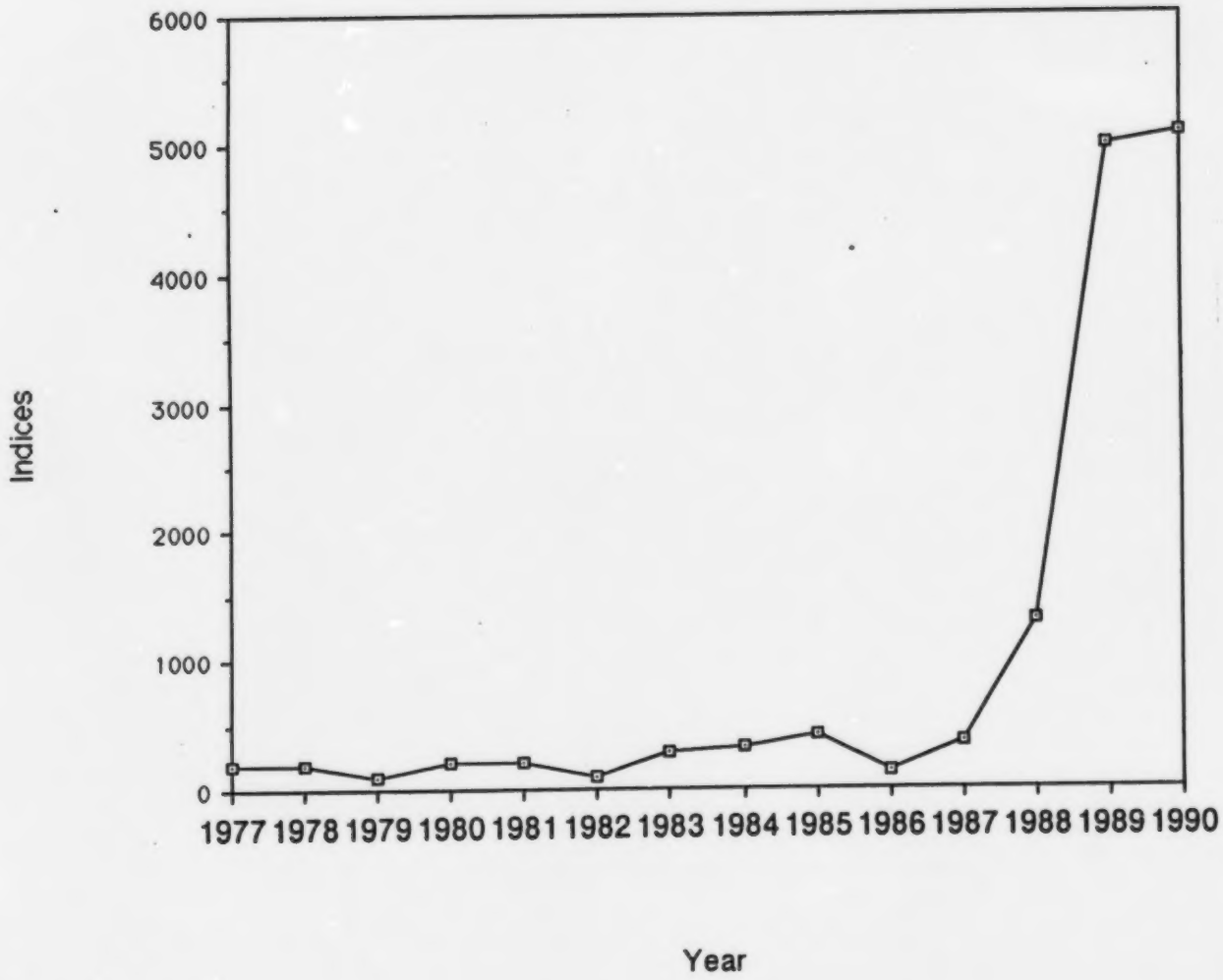
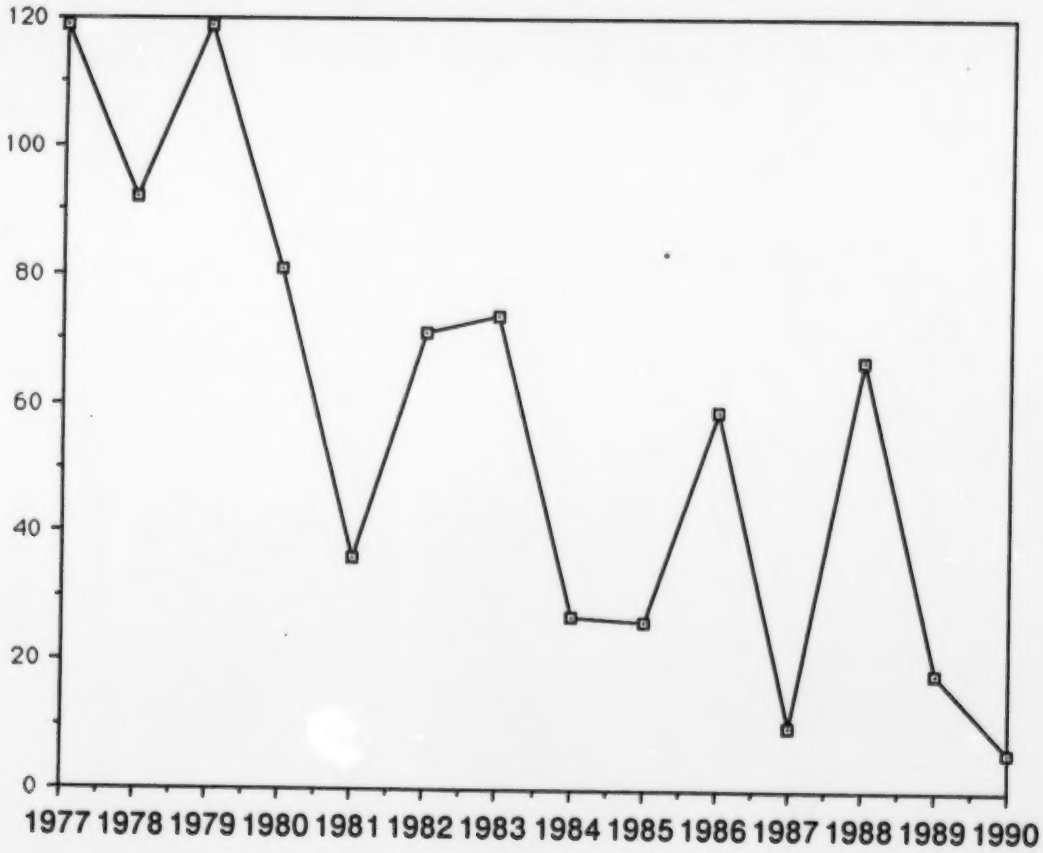


Figure 6 **Track Indices for American Porcupine Fundy National Park**



Bobcat (Figure 7)

Bobcat tracks were recorded in all areas of the park in 1988, the first time since 1979, but only in areas I, II, and IV in 1989 and Area II in 1990.

With snowshoe hare indices declining, bobcat populations appear to be declining but the animals could be moving to other areas. More bobcat sightings have been recorded than in previous years.

Red Fox (Figure 8)

Track indices for red fox showed a substantial increase in 1988, but declined in 1989 and again in 1990 in Areas I, II and IV - 1989 and Areas I and II in 1990.

The red fox population shows a decline in indices. With hare population lov and deep snow reducing the number of small mammals available, and the competition of bobcat and coyote, the red fox population may never increase to what it was in the early 1970's.

Figure 7

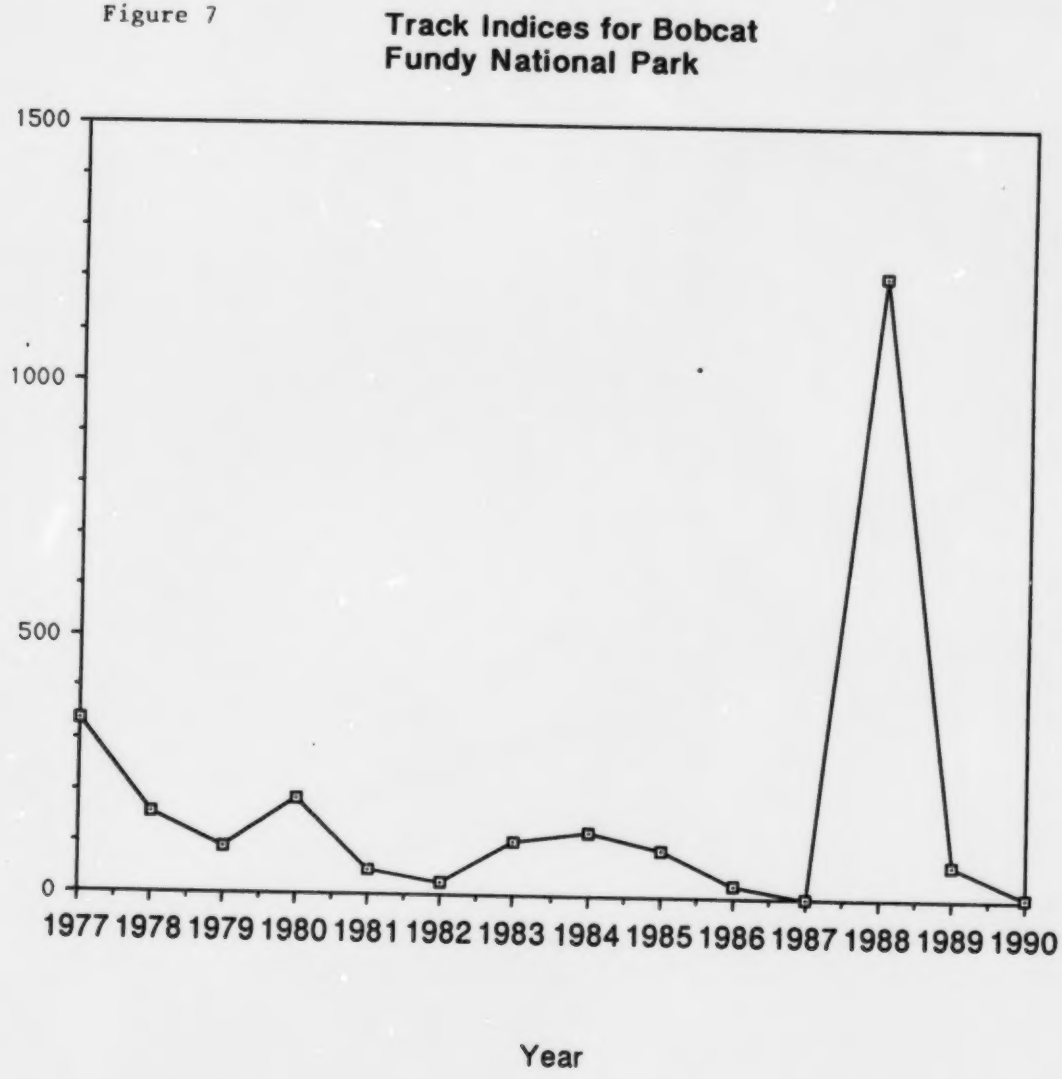
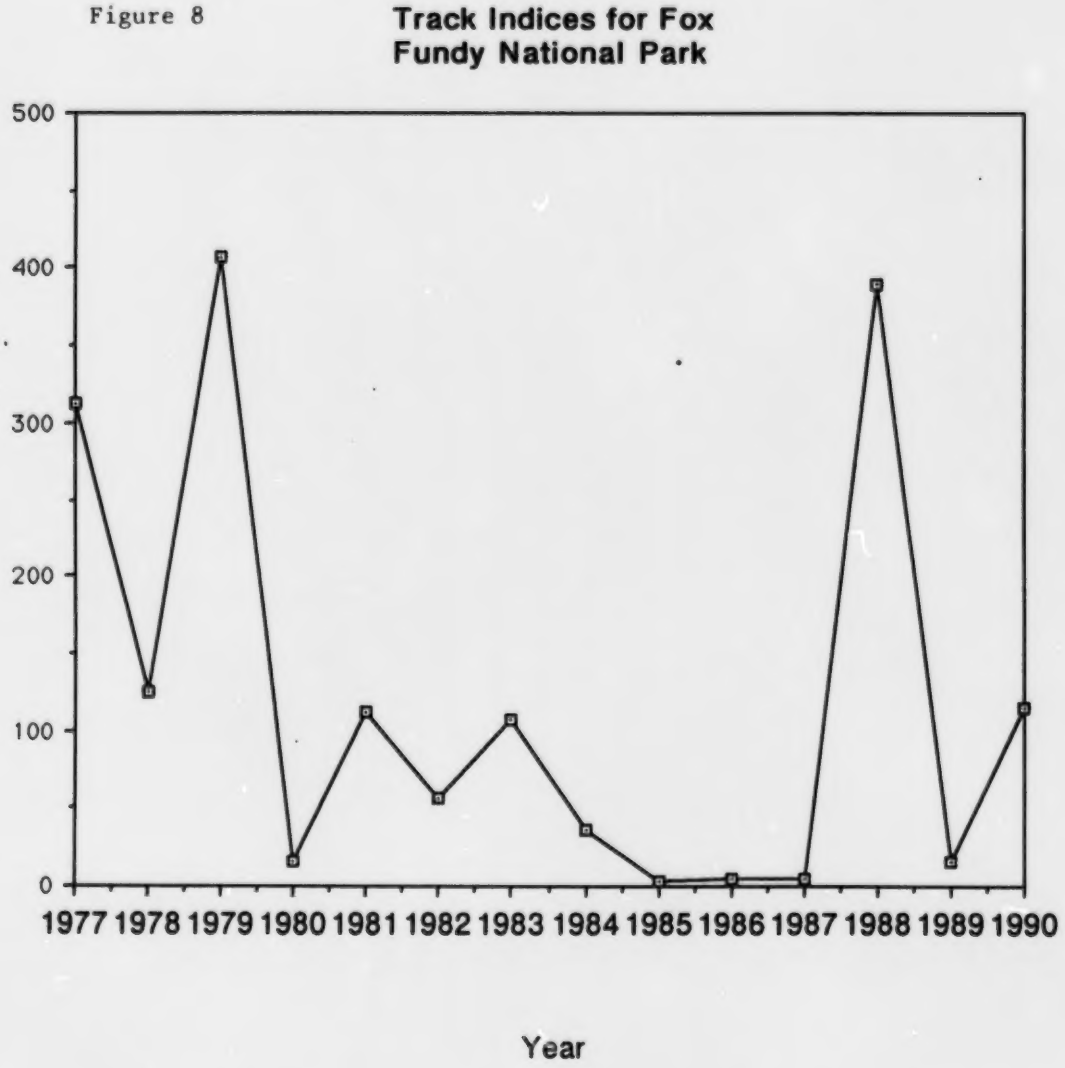

Track Indices for Bobcat
Fundy National Park
1500
1000
500
0
Indices
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Figure 8


Track Indices for Fox
Fundy National Park
500
400
300
200
100
0
Indices
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Mice (Figure 9)

The track indices for mice include all shrews, moles, voles and mice. Indices declined in 1989 and about the same in 1990. The highest mice track indices were in Areas I and III respectively in 1989 and Areas II and IV in 1990. Usually when snow depth is over 20 cm mice indices decrease because of a tendency for these animals to travel under the snow. Since there are no indices for Area III for mice in 1990, the mice population appears stable.

Fisher (Figure 10)

Fisher tracks were recorded in all areas except Area III in 1989-1990 and fisher track indices declined in 1989 and again in 1990. Based on track indices, the fisher population appears to remain relatively stable in the park.

Weasel (Figure 11)

Tracks of the short-tailed weasel have been recorded in all areas of the park in 1989 and in the areas surveyed in 1990. Weasel population indices showed an increase in 1989 and again in 1990 without Area III survey.

Mink (Figure 12)

Tracks were recorded in Areas I, II, and III in 1989 and Areas I and IV in 1990 with Area III not being surveyed. Mink indices were highest in 1989 since 1977.

Figure 9

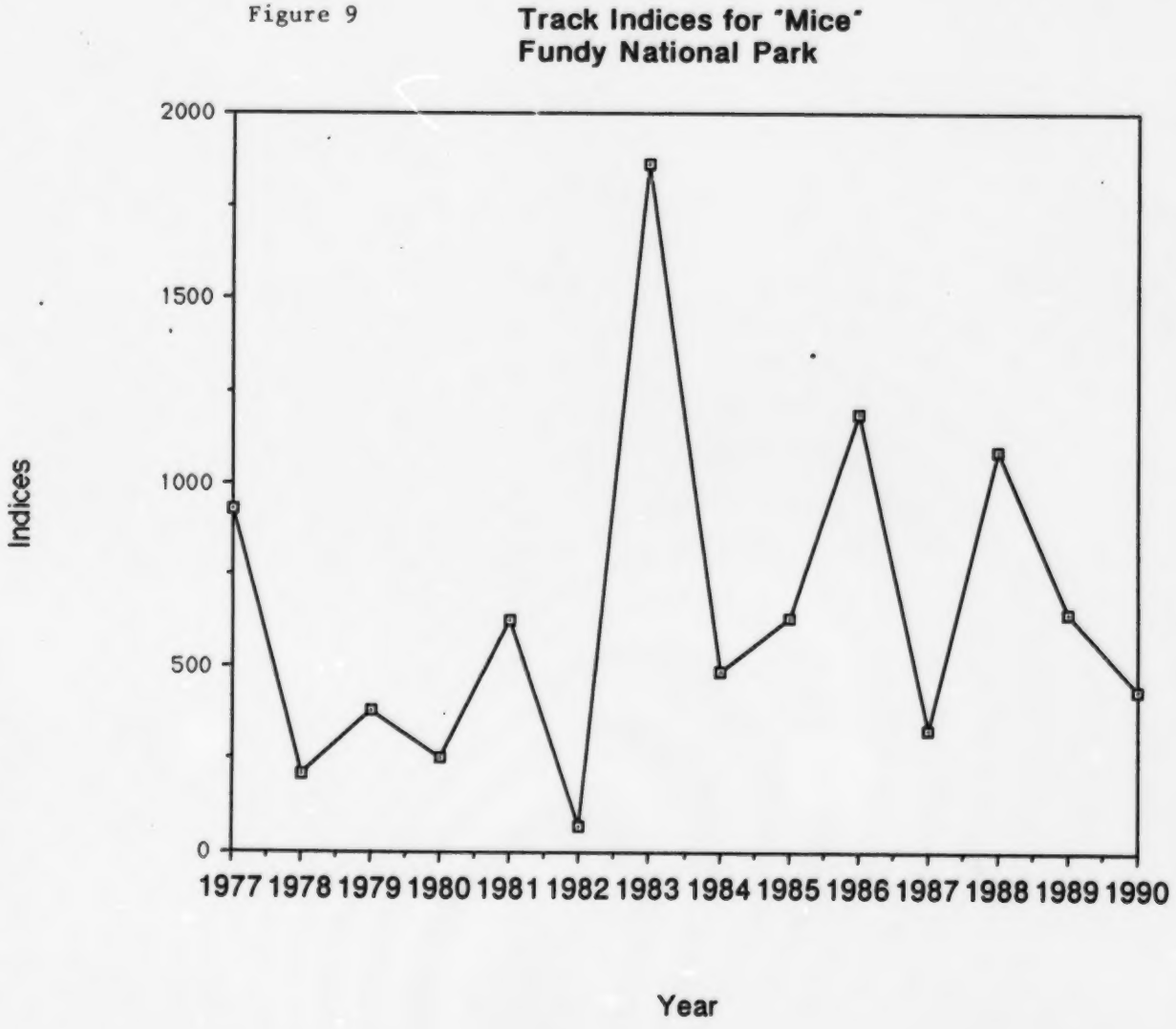

Track Indices for "Mice"
Fundy National Park
2000
1500
1000
500
0
Indices
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Figure 10

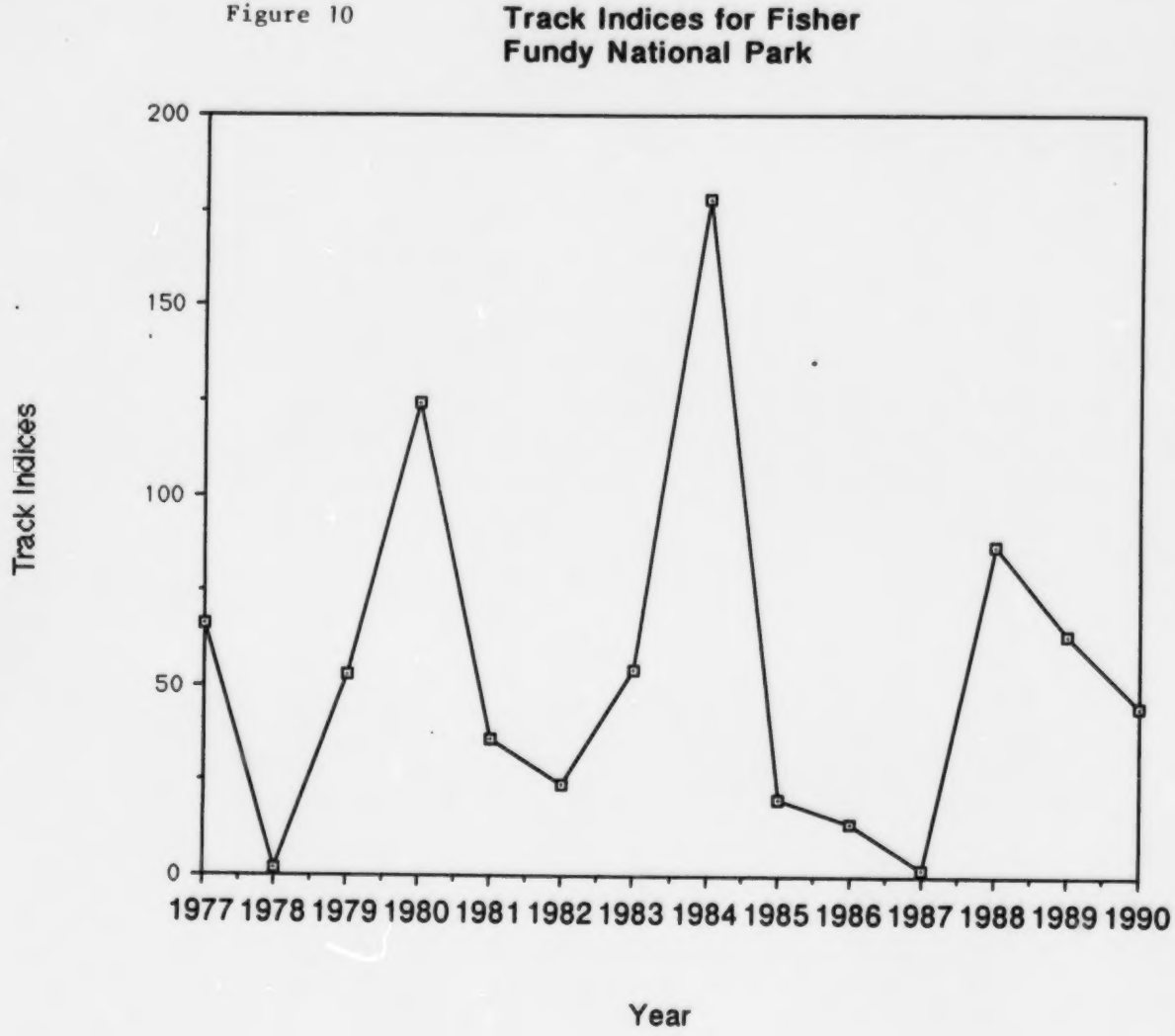

Track Indices for Fisher
Fundy National Park
Track Indices
200
150
100
50
0
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Figure 11

Track Indices for Ermine
Fundy National Park

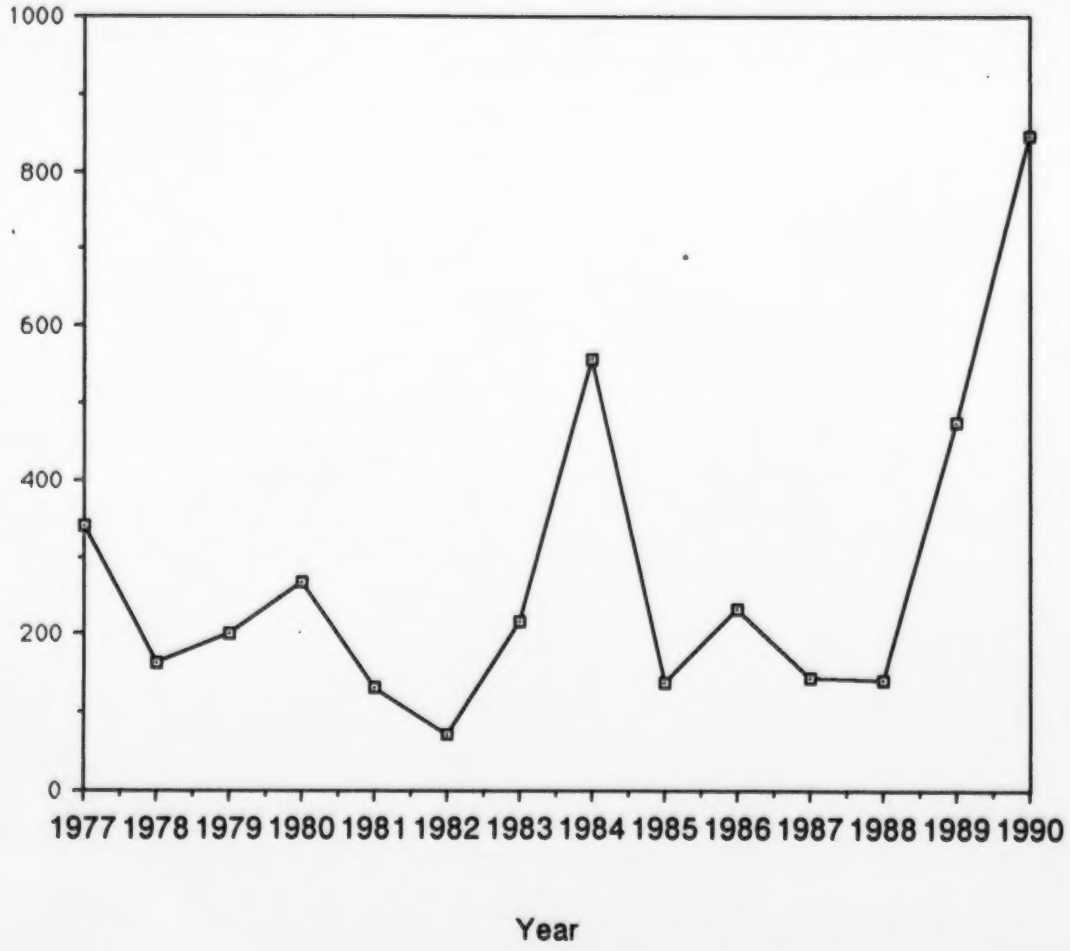
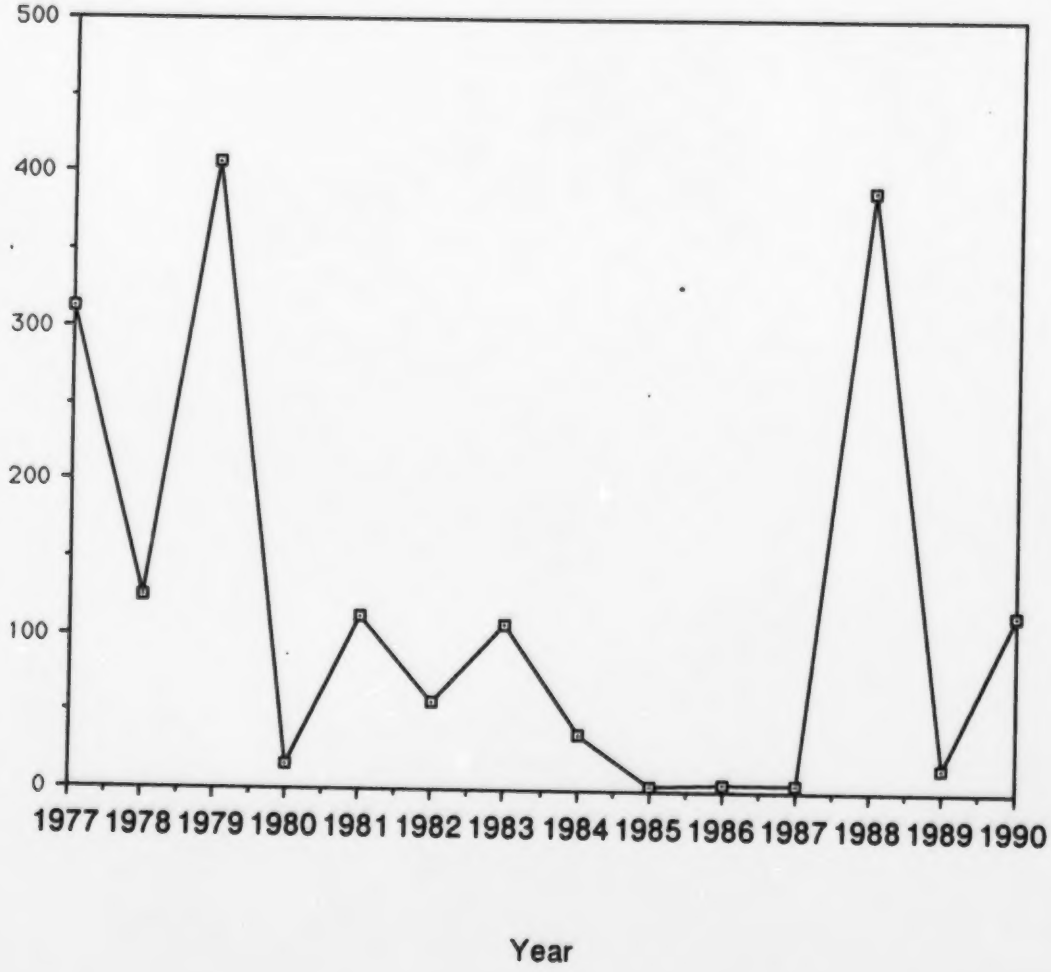


Figure 12 **Track Inidces for American Mink Fundy National Park**



Otter (Figure 13)

The otter is considered uncommon in the park. Tracks have been recorded in the transect lines of 1977, 1979, 1980, 1984 and 1988. Again, like mink, otter are probably not well represented on track transects because of their propensity to follow open streams in winter. Otter tracks were observed at Laverty Lake in February 1990 (S. Sinclair, pers. obs.).

Lynx (Figure 14)

Tracks were recorded in 1978 and 1981 in Area II. Tracks have been sighted on track transect lines in Area IV in 1989. The lynx should be considered rare for Fundy. Poulations have been declining for several decades in Fundy as bobcat populations increase. However, an adult was trapped outside the park in January 1988.

Marten (Figure 15)

Marten tracks were recorded in Areas I, II and IV in 1989 and Areas II and IV in 1990 on the track transects. A marten reintroduction program released 33 marten in Fundy National Park between 1984 and 1988. Marten track indices decreased in 1989 but increased in 1990. More marten were released in December of 1989 and to date 38 marten have been released in Fundy National Park.

Monitoring results on the Pine Marten population may be obtained from American Marten Winter Trapping Results 1989 (G. Sinclair).

Figure 13 **Track Indices for River Otter Fundy National Park**

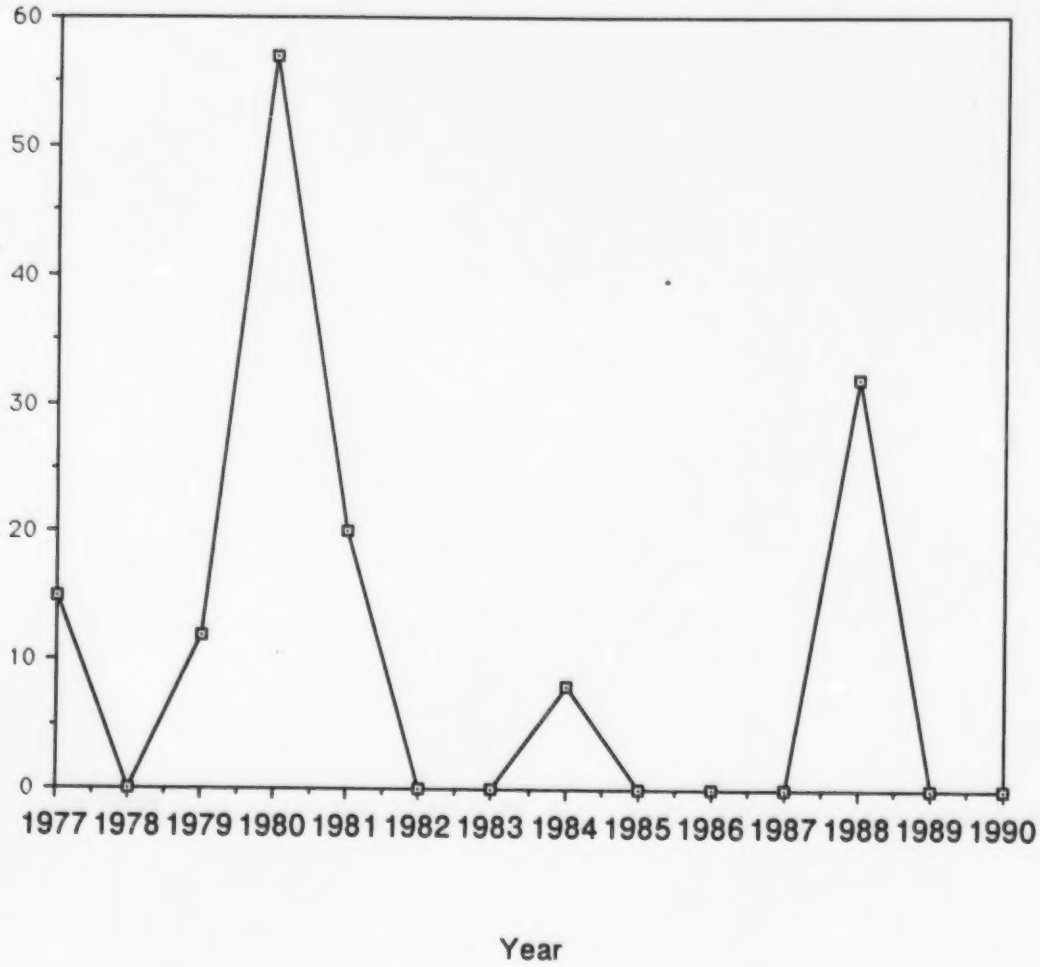


Figure 14

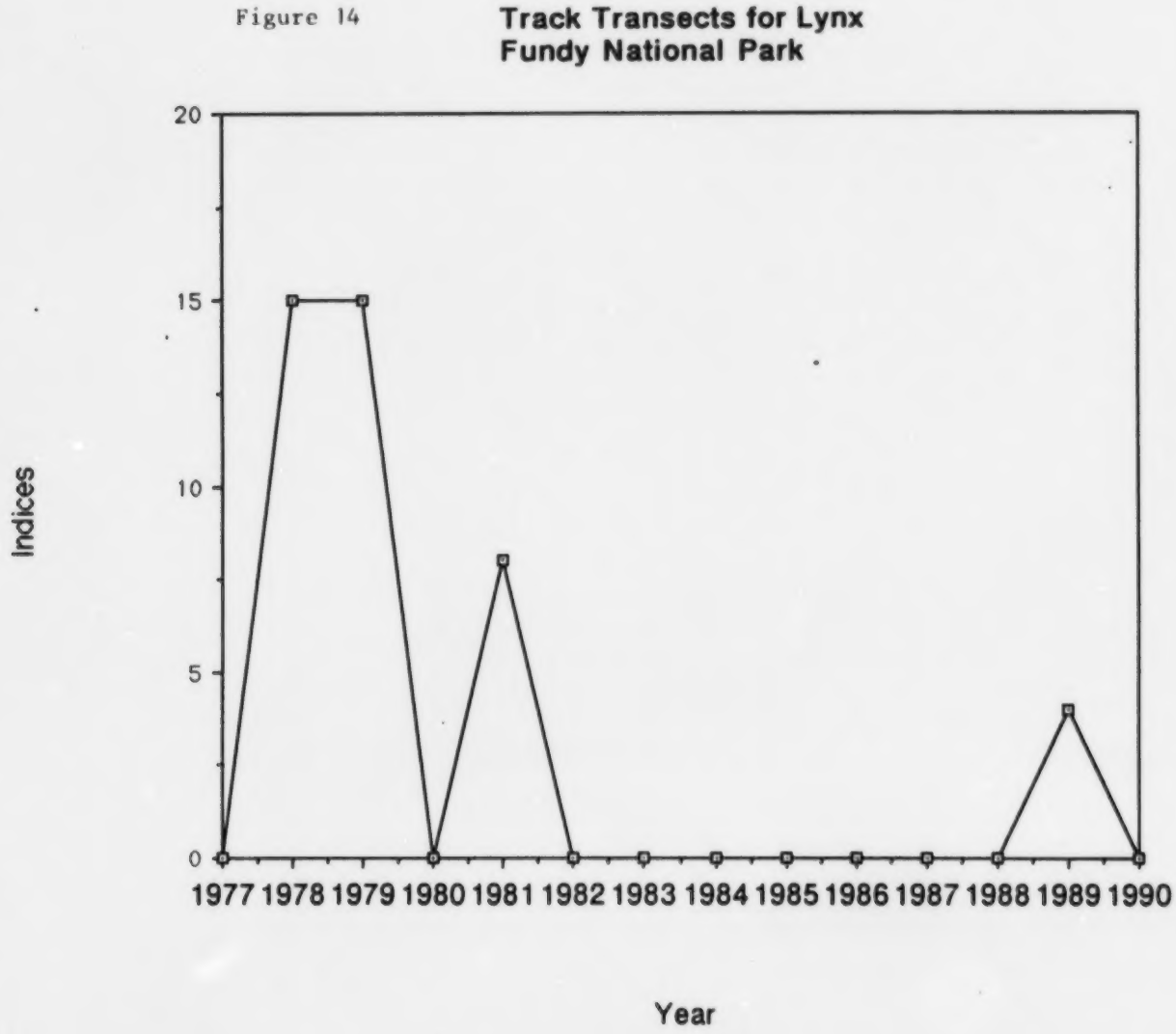
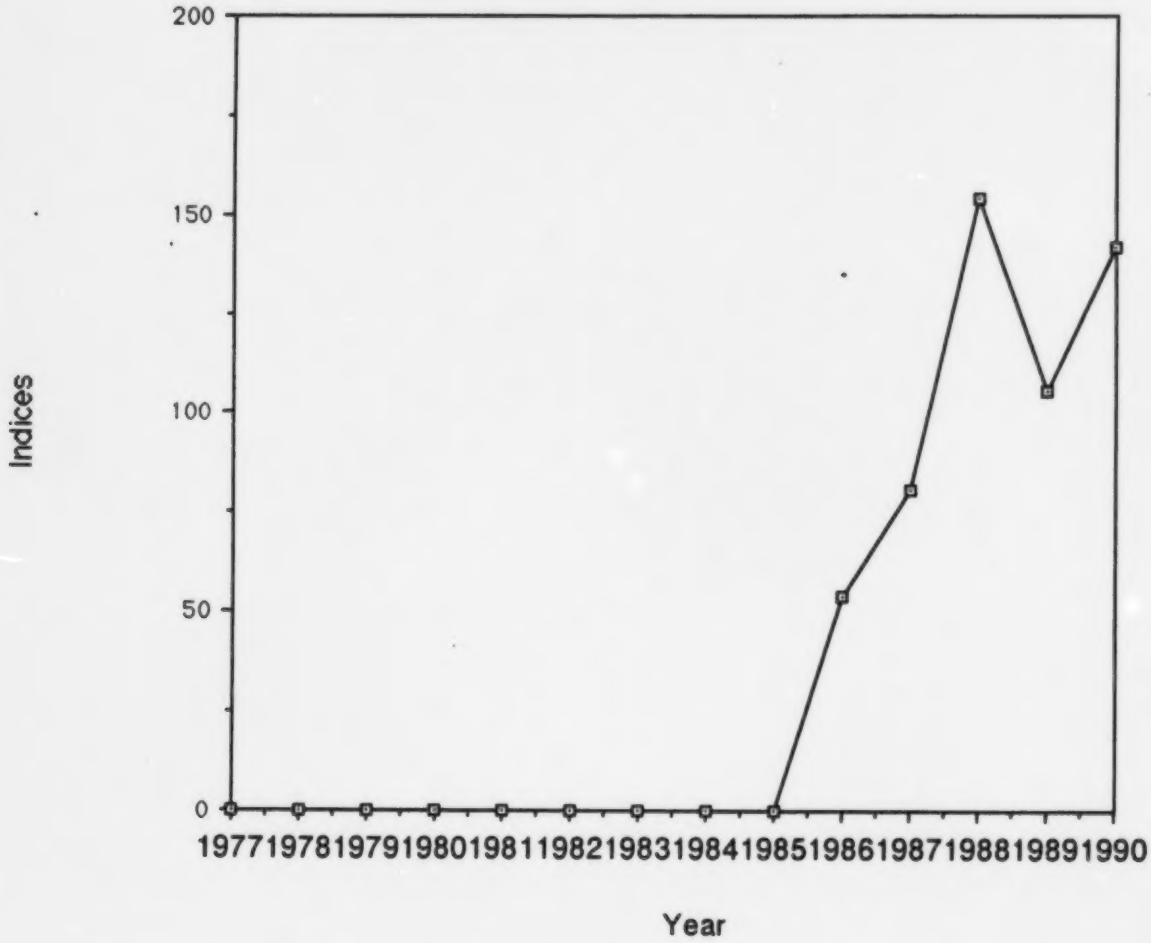

Track Transects for Lynx
Fundy National Park
Indices
20
15
10
5
0
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Figure 15 **Track Indices for American Marten**
Fundy National Park



Snowshoe Hare (Figure 16)

Track indices for snowshoe hare declined since 1988. Of the areas surveyed, Area II had the highest track indices in 1989, Area I had the highest track indices in 1990. This is a wilderness area with softwood plateaus and hardwood ridges.

Track indices probably represent a significantly decreased hare population since 1988. Fundy has experienced 5 successive years of sustained snow depth of over 50 cm. Since 1988 hare being cyclic or heavy predation of the population may be the reason of the lower indices. There being no deer tracks recorded in Areas I, II, and IV and population of fox, bobcat and coyote, all seem to be preying largely on hare.

Coyote (Figure 17)

Coyote tracks were recorded in all areas of the park which were surveyed in 1989 and in 1990. Track indices were highest in softwood stands, possibly reflecting hunting for snowshoe hare.

Track indices for coyote with the exception of 1988 shows a fairly stable population since 1982. Since Area III had the highest indices in 1989 and this area was not surveyed in 1990 the coyote could be a predator on the deer herd as this is where the deer were winter yarding.

A coyote vocalization census has been carried out each year since 1984. The fall results of the 1989 survey indicated a population of 18 animals.

Figure 16 **Track Indices for Varying Hare**
Fundy National Park

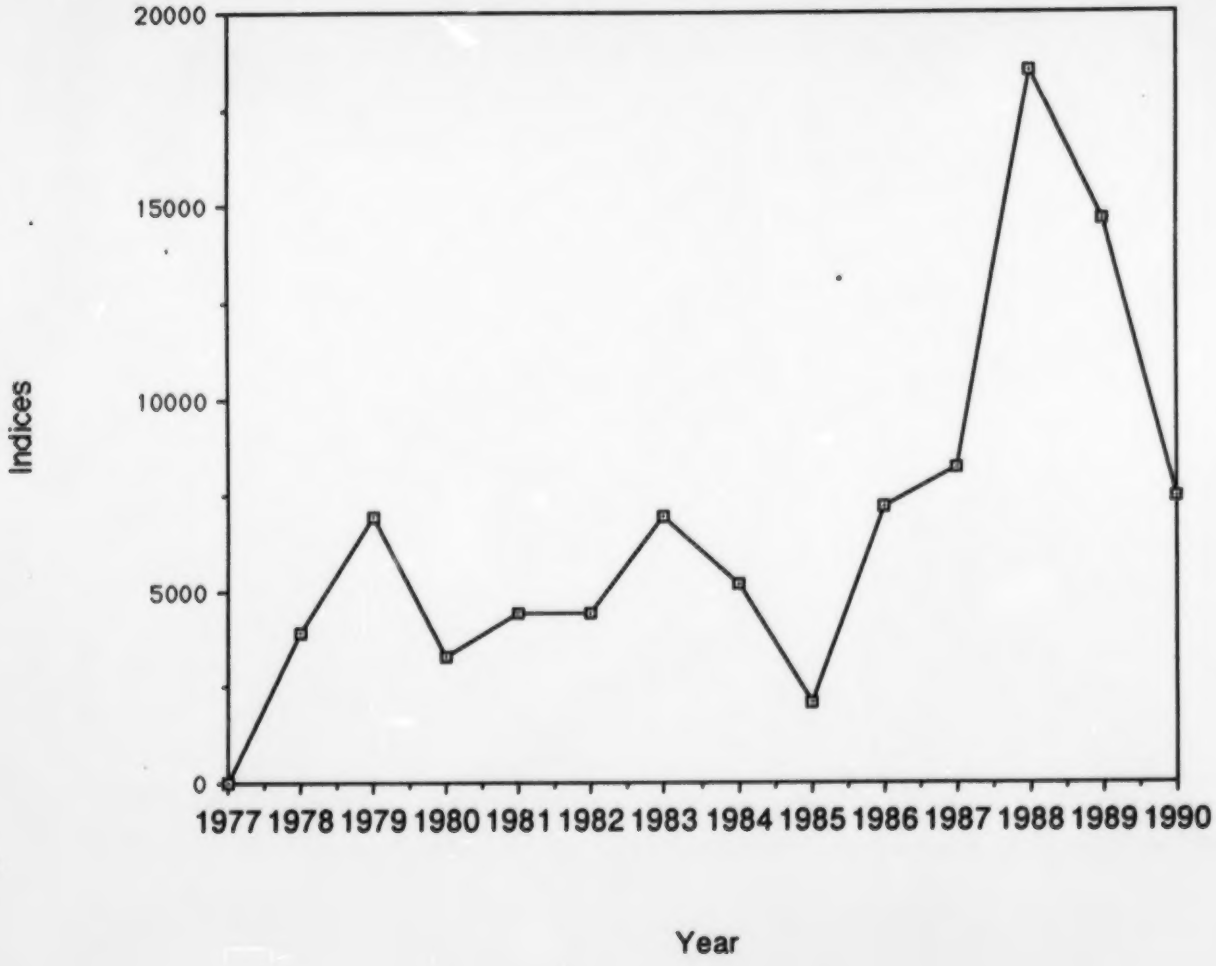


Figure 17

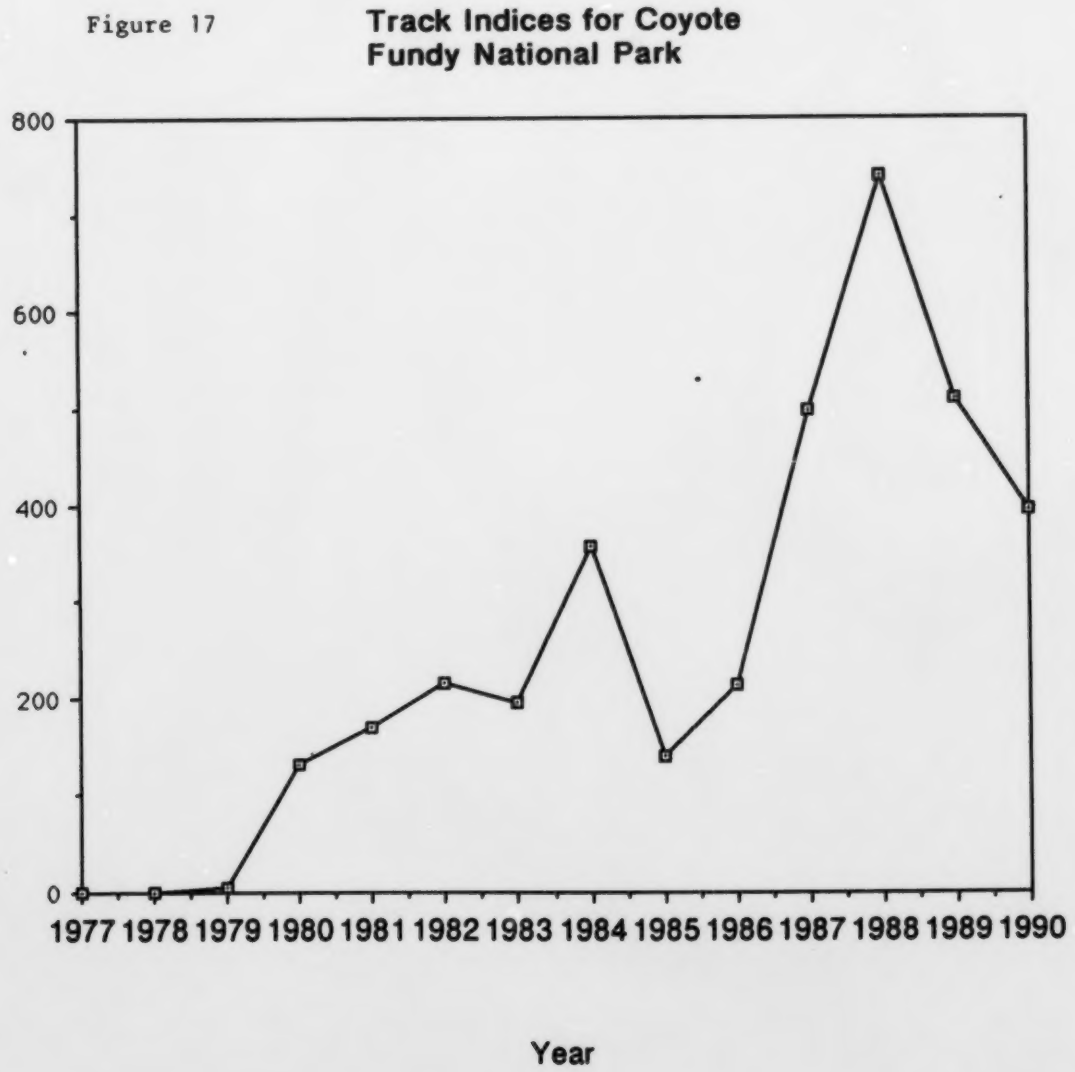
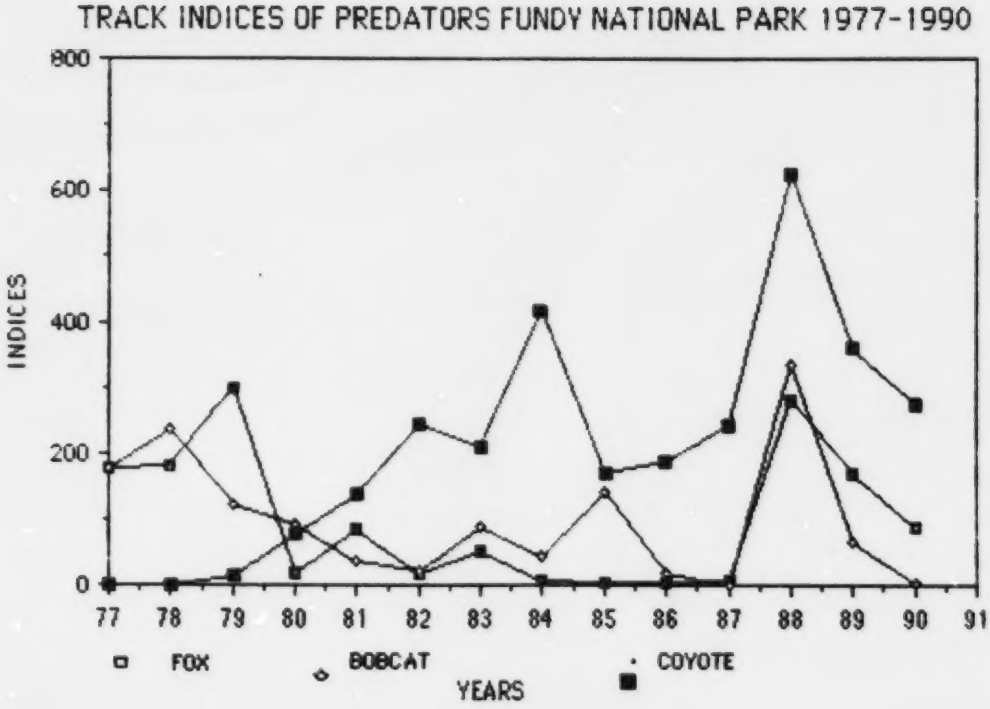

Track Indices for Coyote
Fundy National Park
800
600
400
200
0
Indices
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990
Year

Figure 18


TRACK INDICES OF PREDATORS FUNDY NATIONAL PARK 1977-1990
INDICES
800
600
400
200
0
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
FOX
BOBCAT
COYOTE
YEARS

DISCUSSION

This progress report adds data gathered in 1989 and 1990 and discusses 1989-90 data in light of the trends established in previous years.

In 1989 all twelve transect lines were completed in February and March. In 1990 only 10 transect lines were completed in January, February and March. Lines not completed were 15 and 16 in Area III. Snow depth on the transect lines in 1989 were 10-25 cm on the coast and 50-100 cm in the highlands. In 1990 snow depth on the transect lines were 50-100 cm. Snowfall began in mid-December in 1989 and the major population of the deer herd moved to the coast. In 1989 deer were recorded in two areas of the park - Areas I and III. In 1990 snowfall began on November 20 and measured snowfall was recorded the rest of the winter. The deer herd moved to the coastal area early in December.

No deer tracks were recorded on the track transects in 1990 but deer were observed in Area III (pers. obs. - S. Sinclair). Moose indices in the park remain low in 1989 and showed a slight increase in 1990. Snowfall over 90 cm restricts moose travel and moose population being low, therefore the low indices.

Large predator populations (bobcat, fox and coyote) decreased in 1989-90 with lower indices. Bobcat tracks were not observed in track transect lines in 1990, but two lines were not completed. This area III could be supporting many of the predators because of the deer wintering area. Mice and hare track indices are declining since 1988.

There has been concern expressed in the literature that coyotes may out-compete and/or prey upon foxes. This does not seem to be holding true in Fundy at least in times of high prey populations. Fox and coyote tracks often overlapped.

Track indices for weasel have increased since 1988. Track indices for squirrel is high in 1989-90 compared to previous years. Track indices for mink were recorded in Areas I, II and III in 1989 and in Areas I and IV in 1990. Track indices for fisher has decreased since 1988. The main areas for fisher are Areas I, II and IV since 1977. Track indices for porcupine in Fundy National Park remain stable.

American marten track indices decreased in 1989 but increased in 1990. In 1989 marten tracks were observed in Areas I, II and IV and Areas II and IV in 1990. during the winter of 1989-90 marten tracks were observed in Area III (G. Sinclair, pers. obs.).

RECOMMENDATIONS

1. The track transect project should be continued in the future to provide information on relative mammal population densities.

2. The twelve transect lines that were surveyed this year namely, lines 1, 5, 6, 8, 10, 11, 12, 13, 15, 16, 18 and 20 should be the lines completed in future surveys to maintain a consistent record.

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Sinclair, S., 1989. Census of Coyote Populations in Fundy National Park.

Woodley, S.J., and Bosse, Y, 1987. Census of Coyote Populations in Fundy National Park Using Siren-Elicited Vocalizations.

APPENDICES

Appendix I - 1989

Track days x kilometers walked in each area and the percentage of whole area that was covered.

Area	Softwood	Hardwood	Mixedwood	Other	Total kmxtrack days
Area I	4.68	3.13	9.14	0.44	17.39
	26.91%	17.99%	52.56%	2.53%	
Area II	12.11	4.92	25.36	1.50	43.89
	27.59%	11.21%	53.68%	3.41%	
Area III	2.31	0	4.97	1.14	8.42
	2.74%	0	59.03%	13.54%	
Area IV	5.26	0	8.06	0	13.32
	39.49%	0	60.51%	0	

$$\% \text{ Habitat use in Area X} = \frac{\text{Total habitat transect length x track days x 100}}{\text{Total area transect length x track days}}$$

Appendix II - 1990

Track days x kilometers walked in each area and the percentage of whole area that was covered.

Area	Softwood	Hardwood	Mixedwood	Other	Total kmxtrack days
Area I	3.63	1.74	6.46	0.30	12.13
	29.92%	14.34%	53.25%	0.02%	
Area II	9.69	3.27	17.43	1.50	31.89
	30.38%	10.25%	54.66%	4.70%	
Area III	0	0	0	0	0
	0	0	0	0	0
Area IV	3.58	---	4.92	---	8.50
	42.11%		57.88%		

$$\% \text{ Habitat use in Area X} = \frac{\text{Total habitat transect length x track days x 100}}{\text{Total area transect length x track days}}$$

Appendix III

TRACK TRANSECTS - FUNDY NATIONAL PARK

TRACK INDICES PER AREA --- 1989

Date: _____ Transect No.: _____ Location: _____

Weather Conditions: _____

Snow Depth: _____ cm Condition: _____

Days since last snow: _____ Observers: _____

SPECIES	AREA I		AREA II		AREA III		AREA IV		TOTAL	Total
	No.of tracks	Est.no. Indices	No. of tracks	Est.no. Indices	No.of tracks	Est.no. Indices	No.of tracks	Est. no. Indices		
Fisher	6	35	7	16	---	---	6	45	96	
Weasel	20	115	29	66	2	24	16	120	325	
Mice	21	121	24	55	16	190	3	23	389	
Fox	2	12	19	43	---	---	15	113	168	
Mink	3	17	10	23	3	36	---	---	76	
Squirrel	132	759	820	1868	127	1508	73	548	4683	
W-Tailed Deer	1	6	---	---	101	1200	---	---	1206	
Moose	3	17	---	---	---	---	3	23	40	
Bobcat	5	29	7	16	---	---	3	23	68	
Porcupine	---	---	3	7	2	24	---	---	31	
Otter	---	---	---	---	---	---	---	---	0	
Rabbit	139	799	1195	2723	191	2268	222	1652	7442	
Lynx	---	---	---	---	---	---	1	8	8	
Coyote	7	40	37	84	18	214	3	23	361	
Marten	11	63	7	16	---	---	8	60	140	
TOTAL										

other field, bog, etc.

Appendix IV

TRACK INDICES PER STAND --- 1989

TRACK TRANSECTS - FUNDY NATIONAL PARK

Date: _____ Transect No.: _____ Location: _____

Weather Conditions: _____

Snow Depth: _____ cm Condition: _____

Days since last snow: _____ Observers: _____

SPECIES	COVER TYPES: SOFTWOOD No.of tracks	SOFTWOOD Est.no. indices	HARDWOOD No. of tracks	HARDWOOD Est.no. indices	MIXED WOOD No.of tracks	MIXED WOOD Est.no. indices	OTHER No.of tracks	OTHER Est. no. indices	Specify*	Total
Fisher	10	41	3	37	6	13	0	---		
Weasel	31	127	12	149	18	38	5	162		
Mice	26	107	18	224	11	23	9	292		
Fox	3	12	1	12	29	61	2	65		
Mink	10	41	--	--	1	2	8	260		
Squirrel	741	3042	12	149	368	774	31	1006		
W-tailed Deer	28	115	---	---	71	149	3	97		
Moose	3	12	---	---	3	6	---	---		
Bobcat	12	49	1	12	2	4	---	---		
Porcupine	4	16	---	---	1	2	---	---		
Otter	---	---	---	---	---	---	---	---		
Hare	909	3732	85	1056	470	989	273	8864		
Lynx	1	4	---	---	---	---	---	---		
Coyote	25	103	10	124	26	55	7	227		
Marten	21	86	1	12	4	8	---	---		
TOTAL										

Appendix V

TRACK TRANSECTS - FUNDY NATIONAL PARK

TRACK INDICES PER AREA -- 1990

Date:_____ Transect No.:_____ Location:_____

Weather Conditions:_____

Snow Depth:_____cm Condition:_____

Days since last snow:_____ Observers:_____

	Area I		Area II		Area III		Area IV			
SPECIES	No.of tracks	Est.no. Indices	No. of tracks	Est.no. Indices	No.of tracks	Est.no. Indices	No.of tracks	Est. no. Indices	TOTAL	Total
Fisher	2	16	7	22	---	---	1	12		
Weasel	33	272	21	66	---	---	5	59		
Mice	8	66	65	204	---	---	11	129		
Fox	6	49	12	38	---	---	---	---		
Mink	3	25	---	---	---	---	1	12		
Squirrel	138	1138	354	1110	---	---	11	129		
White-Tailed Deer	---	---	---	---	---	---	---	---		
Moose	---	---	---	---	---	---	11	129		
Bobcat	---	---	1	3	---	---	---	---		
Porcupine	1	8	---	---	---	---	---	---		
Otter	---	---	---	---	---	---	---	---		
Rabbit	290	2391	450	1411	---	---	38	447		
Lynx	---	---	---	---	---	---	---	---		
Coyote	21	173	25	78	---	---	2	24		
Marten	---	---	16	50	---	---	8	94		
TOTAL										

Appendix VI

TRACK TRANSECTS - FUNDY NATIONAL PARK

TRACK INDICES PER STAND -- 1990

Date: _____ Transect No.: _____ Location: _____

Weather Conditions: _____

Snow Depth: _____ cm Condition: _____

Days since last snow: _____ Observers: _____

COVER TYPES

SPECIES	SOFTWOOD		HARDWOOD		MIXED WOOD		OTHER			
	No.of tracks	Est.no. indices	No. of tracks	Est.no. indices	No.of tracks	Est.no. indices	No.of tracks	Est. no. indices	Specify*	Total
Fisher	4	24	---	---	6	21	---	---		
Weasel	36	213	3	60	21	73	9	500		
Mice	19	112	10	200	35	121	---	---		
Fox	1	6	3	60	14	49	---	---		
Mink	4	24	---	---	---	---	---	---		
Squirrel	180	1065	42	838	239	830	42	2333		
W-tailed Deer	---	---	---	---	---	---	---	---		
Moose	11	65	---	---	---	---	---	---		
Bobcat	1	6	---	---	---	---	---	---		
Porcupine	1	6	---	---	---	---	---	---		
Otter	---	---	---	---	---	---	---	---		
Rabbit	458	2710	18	359	238	826	64	3555		
Lynx	---	---	---	---	---	---	---	---		
Coyote	19	112	11	220	18	62	---	---		
Marten	24	142	---	---	---	---	---	---		
TOTAL										

APPENDIX VII TRACK INDICES PER AREA

SPECIES	AREA	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
FISHER	1	38	2	0	39	5	22	24	52	9	12	0	51	35	16
	2	0	0	29	4	15	8	11	69	6	0	3	31	16	22
	3	0	0	0	71	0	0	0	12	4	0	0	0	0	0
	4	0	0	0	0	0	0	8	6	4	8	0	33	45	12
TOTAL		38	2	29	114	20	30	43	139	23	20	3	115	96	50
WEASEL	1	104	103	26	78	42	17	63	58	18	63	45	43	115	272
	2	90	48	43	29	15	0	55	65	76	56	68	52	66	66
	3	47	5	112	79	0	59	71	178	32	48	59	6	24	0
	4	61	9	43	0	0	0	8	18	39	74	5	123	120	59
TOTAL		302	165	224	186	57	76	197	319	165	241	177	224	325	397
MICE	1	186	124	60	65	56	31	29	116	125	92	25	297	121	66
	2	161	27	92	110	457	17	584	44	157	319	47	363	55	204
	3	326	71	112	0	71	24	475	166	170	48	154	30	190	0
	4	154	22	177	0	0	0	24	24	59	49	0	123	23	129
TOTAL		827	244	441	175	584	72	1112	350	511	508	226	813	389	399
FOX	1	117	36	89	7	11	4	5	6	3	0	0	101	12	49
	2	54	59	191	12	73	14	48	0	0	3	6	39	43	38
	3	0	86	0	0	0	0	0	0	0	0	0	131	0	0
	4	7	0	17	0	0	0	0	0	0	0	0	8	113	0
TOTAL		178	181	297	19	84	18	53	6	3	3	6	279	168	87
MINK	1	10	0	2	13	2	4	0	6	6	6	0	0	17	25
	2	2	3	0	0	11	0	0	7	0	0	3	0	23	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	36	0
	4	0	0	0	0	0	0	0	18	8	0	0	0	0	12
TOTAL		12	3	2	13	13	4	0	31	14	6	3	0	76	37

APPENDIX VII TRACK INDICES PER AREA

SPECIES	AREA	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SQUIRREL	1	99	42	2	98	13	26	34	90	37	12	51	333	759	1138
	2	32	46	39	29	128	26	110	46	110	46	71	144	1868	1110
	3	59	62	24	32	142	12	368	71	277	36	154	469	1508	0
	4	29	26	82	0	0	9	27	9	133	0	9	427	548	129
TOTAL		219	176	147	159	283	73	539	216	557	94	285	1373	4678	2377
W.T.DEER	1	71	13	42	416	45	40	227	181	310	46	344	0	6	0
	2	20	27	255	374	26	26	826	435	1377	666	74	0	0	0
	3	807	1539	1701	918	2417	1924	1069	2007	1318	3800	5986	998	1200	0
	4	140	13	112	0	0	137	314	106	59	410	115	0	0	0
TOTAL		1038	1592	2110	1708	2488	2127	2436	2729	3064	4922	6519	998	1206	0
MOOSE	1	20	15	36	13	14	0	102	0	24	12	0	29	17	0
	2	49	7	120	69	33	52	29	37	6	3	9	0	0	0
	3	59	0	177	0	0	0	0	0	0	0	0	0	0	0
	4	7	0	48	0	0	64	157	0	12	82	37	0	23	129
TOTAL		135	22	381	82	47	116	288	37	42	97	46	29	40	129
BOBCAT	1	51	2	40	33	7	0	0	0	0	6	0	14	29	0
	2	98	35	17	37	29	11	48	16	0	13	0	9	16	3
	3	24	86	59	24	0	12	36	24	139	0	0	279	0	0
	4	4	112	4	0	0	0	4	6	0	0	0	33	23	0
TOTAL		177	235	120	94	36	23	88	46	139	19	0	335	68	3
PORCUPINE	1	13	15	21	0	2	0	0	0	0	0	6	7	0	8
	2	27	22	17	8	4	5	11	7	0	0	0	17	7	0
	3	42	38	118	55	237	95	59	48	40	154	24	59	24	0
	4	54	64	82	0	0	0	8	0	0	0	0	0	0	0
TOTAL		136	139	238	63	243	100	78	55	40	154	30	83	31	8

APPENDIX VII TRACK INDICES PER AREA

SPECIES	AREA	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
OTTER	1	3	0	2	13	2	0	0	13	0	0	0	22	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	8	0	0
TOTAL		3	0	2	13	2	0	0	13	0	0	0	30	0	0
V.HARE	1	0	869	1048	1404	276	708	401	1201	442	1139	1318	7487	799	2391
	2	0	297	1340	252	2283	956	1523	795	621	1765	1043	9034	2723	1411
	3	0	1501	1087	530	2962	1675	3147	1390	800	511	4584	4038	2268	0
	4	0	1162	5696	0	0	788	976	2053	424	1248	738	1670	1652	447
TOTAL		0	3829	9171	2186	5521	4127	6047	5439	2287	4663	7683	22229	7442	4249
LYNX	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	4	0	0	11	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	8	0
TOTAL		0	4	0	0	11	0	0	0	0	0	0	0	8	0
COYOTE	1	0	0	0	0	34	58	15	103	12	86	185	246	40	173
	2	0	0	15	29	55	100	70	136	34	41	27	122	84	78
	3	0	0	0	48	47	71	95	154	51	12	24	178	214	0
	4	0	0	0	0	0	14	31	24	71	49	9	82	23	24
TOTAL		0	0	15	77	136	243	211	417	168	188	245	628	361	275
P.MARTEN	1	0	0	0	0	0	0	0	0	0	81	6	14	63	0
	2	0	0	0	0	0	0	0	0	0	0	30	70	16	50
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	16	18	140	60	94
TOTAL		0	0	0	0	0	0	0	0	0	97	54	224	139	144

APPENDIX VIII TRACK INDICES PER STAND 1977-1990

SPECIES	HABITAT	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
FISHER	SOFTWOOD	36	2	25	32	13	16	22	155	13	14	0	44	41	24
	HARDWOOD	0	0	28	29	18	0	17	13	0	0	0	22	37	0
	MIXEDWOOD	0	0	0	0	5	8	7	4	3	0	2	21	13	21
	OTHER	30	0	0	0	0	0	0	0	4	0	0	0	0	0
WEASEL	SOFTWOOD	142	129	105	72	52	16	72	84	116	90	54	114	127	213
	HARDWOOD	45	6	0	103	18	14	51	126	13	65	48	0	149	60
	MIXEDWOOD	137	27	13	34	22	4	24	18	9	45	43	29	38	73
	OTHER	75	0	83	29	40	38	71	330	0	32	0	0	162	500
MICE	SOFTWOOD	277	104	186	16	68	12	347	113	292	203	38	287	107	112
	HARDWOOD	116	67	52	235	223	42	995	88	243	877	64	647	224	200
	MIXEDWOOD	401	40	45	34	252	18	97	28	25	88	29	149	23	121
	OTHER	181	0	95	57	81	0	424	256	70	0	195	0	292	0
FOX	SOFTWOOD	68	80	183	16	3	16	36	0	3	5	0	138	12	6
	HARDWOOD	33	0	84	0	9	0	34	0	0	0	0	108	12	60
	MIXEDWOOD	196	44	81	7	80	2	2	0	0	0	5	24	61	49
	OTHER	15	0	59	0	20	38	35	37	0	0	0	120	65	0
MINK	SOFTWOOD	0	4	2	0	0	0	0	21	8	0	0	0	41	24
	HARDWOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIXEDWOOD	0	0	0	0	5	2	0	4	1	0	0	0	2	0
	OTHER	75	0	0	57	40	38	0	0	0	32	32	0	260	0
SQUIRREL	SOFTWOOD	88	100	72	120	46	43	163	100	349	68	65	588	3042	1065
	HARDWOOD	45	36	0	59	62	42	34	113	38	52	128	172	149	838
	MIXEDWOOD	59	16	18	24	92	8	59	28	25	9	41	189	774	830
	OTHER	0	46	0	0	0	0	35	73	0	0	130	360	1006	2333

APPENDIX VIII TRACK INDICES PER STAND 1977-1990

SPECIES	HABITAT	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
W.T.DEER	SOFTWOOD	359	440	479	1420	137	730	980	1007	1980	2975	1881	548	115	0
	HARDWOOD	59	6	0	1144	0	0	354	113	730	537	96	172	0	0
	MIXEDWOOD	352	112	344	20	214	154	306	2789	208	267	224	104	149	0
	OTHER	30	254	201	286	61	1221	318	916	211	619	390	300	97	0
MOOSE	SOFTWOOD	30	18	105	120	20	43	83	63	31	45	0	5	12	65
	HARDWOOD	28	0	0	0	0	166	67	0	0	26	0	0	0	0
	MIXEDWOOD	29	3	123	0	27	18	92	2	1	2	23	8	6	0
	OTHER	90	0	0	114	0	0	0	0	0	0	32	0	0	0
BOBCAT	SOFTWOOD	38	96	55	112	23	4	18	25	90	18	0	54	49	6
	HARDWOOD	38	42	24	15	9	14	67	25	0	0	0	0	12	0
	MIXEDWOOD	186	19	10	0	13	6	17	0	0	5	0	16	4	0
	OTHER	75	0	0	57	0	0	0	73	0	0	0	1141	0	0
PORCUPINE	SOFTWOOD	68	64	87	48	23	31	11	25	26	59	8	59	16	6
	HARDWOOD	12	12	16	29	0	0	17	0	0	0	0	0	0	0
	MIXEDWOOD	39	16	16	3	13	2	11	2	0	0	2	8	2	0
	OTHER	0	0	0	0	0	38	35	0	0	0	0	0	0	0
OTTER	SOFTWOOD	0	0	0	0	0	0	0	8	0	0	0	5	0	0
	HARDWOOD	0	0	0	0	0	0	0	0	0	0	0	22	0	0
	MIXEDWOOD	0	0	0	0	0	0	0	0	0	0	0	5	0	0
	OTHER	15	0	12	57	20	0	0	0	0	0	0	0	0	0
V.HARE	SOFTWOOD	0	1803	4867	1770	2249	1581	2540	3030	1571	3771	2732	11773	3732	2710
	HARDWOOD	0	121	8	440	445	333	202	328	166	236	1284	1509	1056	359
	MIXEDWOOD	0	177	309	212	1668	604	420	417	60	316	445	3982	989	826
	OTHER	0	1824	1763	857	120	1870	3781	1392	264	2893	3766	1231	8864	3555

APPENDIX VIIITRACK INDICES PER STAND 1977-1990

SPECIES	HABITAT	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
LYNX	SOFTWOOD	0	14	0	0	0	0	0	0	0	0	0	0	4	0
	HARDWOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIXEDWOOD	0	1	0	0	8	0	0	0	0	0	0	0	0	0
	OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COYOTE	SOFTWOOD	0	0	15	72	49	93	112	155	114	59	27	232	103	112
	HARDWOOD	0	0	0	59	89	28	0	227	13	118	209	194	124	220
	MIXEDWOOD	0	0	4	0	32	57	11	75	13	36	34	104	55	62
	OTHER	0	0	0	0	0	38	71	0	0	0	227	210	227	0
P.MARTEN	SOFTWOOD	0	0	0	0	0	0	0	0	0	36	42	133	86	142
	HARDWOOD	0	0	0	0	0	0	0	0	0	0	0	0	12	0
	MIXEDWOOD	0	0	0	0	0	0	0	0	0	18	7	21	8	0
	OTHER	0	0	0	0	0	0	0	0	0	0	32	0	0	0